

WHAT IS CLAIMED IS:

1. An enzyme which has an activity to deamidate amido groups in a protein.
2. An enzyme which has an activity to deamidate amido groups in a protein by directly acting upon the amido groups without cutting peptide bonds and without cross-linking a protein.
3. The enzyme as claimed in claim 1 or 2, wherein said enzyme is derived from a microorganism.
4. A polypeptide which comprises a polypeptide having an activity to deamidate amido groups in protein and having the amino acid sequence of Sequence No. 6 shown in the Sequence Listing wherein one or more of amino acid residues of the amino acid sequence may be modified by at least one of deletion, addition, insertion and substitution.
5. A polypeptide which has the amino acid sequence of Sequence No. 6 shown in the Sequence Listing.
6. A nucleotide which encodes a polypeptide having an activity to deamidate amido groups in protein.
7. A nucleotide which encodes a polypeptide having an activity to deamidate amido groups in a protein by directly acting upon the amido groups without cutting peptide bonds and without cross-linking a protein.
8. A nucleotide which comprises a nucleotide being selected from the following nucleotides (a) to (g) and

encoding a polypeptide having an activity to deamidate amido groups in protein;

(a) a nucleotide which encodes a polypeptide having the amino acid sequence of Sequence No. 6 shown in the Sequence Listing,

(b) a nucleotide which encodes a polypeptide having the amino acid sequence of Sequence No. 6 shown in the Sequence Listing, wherein one or more amino acid residues of the amino acid sequence are modified by at least one of deletion, addition, insertion and substitution,

(c) a nucleotide which has the nucleotide sequence of Sequence No. 5 shown in the Sequence Listing,

(d) a nucleotide which has the nucleotide sequence of Sequence No. 5 shown in the Sequence Listing, wherein one or more bases of the nucleotide sequence are modified by at least one of deletion, addition, insertion and substitution,

(e) a gene which hybridizes with any one of the aforementioned nucleotides (a) to (d) under a stringent condition,

(f) a nucleotide which has homology with any one of the aforementioned nucleotides (a) to (d), and

(g) a nucleotide which is degenerate with respect to any one of the aforementioned nucleotides (a) to (f).

9. A nucleotide which comprises a nucleotide encoding a polypeptide having the amino acid sequence of Sequence No. 6 shown in the Sequence Listing.

10. A recombinant vector which contains the nucleotide of any one of claims 6 to 9.

11. A transformant transformed with the recombinant vector of claim 10.

12. A method for producing an enzyme having an activity to deamidate amido groups in protein, which comprises culturing the transformant of claim 11, thereby allowing said transformant to producing an enzyme having an activity to deamidate amido groups in protein, and subsequently collecting the enzyme having an activity to deamidate amido groups in protein from the culture mixture.

13. A recombinant polypeptide having an activity to deamidate amido groups in protein, which is obtained by the method of claim 12 by culturing the transformant and collecting the polypeptide from said culture mixture.

14. A method for producing a novel enzyme, which comprises culturing a microorganism in a nutrient medium, thereby allowing said microorganism to produce a novel enzyme having an activity to deamidate amido groups in protein, and subsequently collecting said enzyme.

15. A method for producing a novel enzyme having an activity to deamidate amido groups bonded in protein,

which comprises culturing a microorganism in a nutrient medium, thereby allowing the microorganism to produce a novel enzyme which has an activity to deamidate amido groups in protein by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein, and subsequently collecting said enzyme.

16. The method according to claim 14 or 15, wherein the microorganism is a bacterium which is classified into *Cytophagales* or *Actinomycetes*.

17. The method according to claim 14 or 15, wherein the microorganism is a bacterium which is classified into *Flavobacteriaceae*.

18. The method according to claim 14 or 15, wherein the microorganism is selected from the genus *Chryseobacterium*, the genus *Flavobacterium*, the genus *Empedobacter*, the genus *Sphingobacterium*, the genus *Aureobacterium* and the genus *Myroides*.

19. A method for modifying a protein and/or a peptide, which comprises allowing an enzyme having an activity to deamidate amido groups in protein and peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein to react with a protein and/or a peptide.

20. A composition for use in modification of a protein and/or a peptide, which comprises an enzyme having an activity to deamidate amido groups in protein and

peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein, as the active ingredient.

21. A method for improving functionality of a plant or animal protein and/or a peptide, which comprises allowing an enzyme having an activity to deamidate amido groups in protein and peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein to act upon said protein and/or peptide.

22. A method for improving functionality of food containing a plant or animal protein and/or a peptide, which comprises allowing an enzyme having an activity to deamidate amido groups in protein and peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein to act upon said food.

23. A method for improving extraction efficiency of a plant or animal protein and/or a peptide from a crude material, which comprises allowing an enzyme having an activity to deamidate amido groups in protein and peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein to act upon a crude material containing said protein and/or peptide.

24. A method for controlling reaction of transglutaminase, which comprises using an enzyme having

an activity to deamidate amido groups in protein and peptide by directly acting upon the groups without causing severing of peptide bond and cross-linking of protein.

25. A method for modifying a target protein or peptide, comprising allowing an enzyme, which is capable of deamidating amido groups in target proteins and peptides by directly acting upon said amido groups without cutting peptide bonds and without cross-linking said target proteins or peptides, to act on said target protein or peptide.

26. The method of Claim 25, wherein said target protein or peptide to be modified is derived from a plant or animal such that the functionality of said protein or peptide is improved.

27. The method of Claim 25, wherein said target protein or peptide to be modified is derived from food such that the functionality of said food is improved.

28. The method of Claim 25, wherein said target protein or peptide is contained in a crude material such that the extraction efficiency of said target protein or peptide is improved.

29. The method of Claim 25, which further comprises the step of allowing a transglutaminase to act on said target protein or peptide.

30. The method of Claim 29, wherein said enzyme is allowed to act on said target protein or peptide before

said transglutaminase is allowed to act on said target protein or peptide.

31. The method of Claim 29, wherein said transglutaminase is allowed to act on the target protein or peptide before said enzyme is allowed to act on said target protein or peptide.

32. The method of Claim 29, wherein said enzyme and said transglutaminase are allowed to act on said target protein or peptide at the same time.

33. The method of Claim 25, which further comprises the step of allowing a protease and a glutaminase to act on said target protein or peptide.

34. The method of Claim 25, wherein said target protein has a molecular weight of 5,000, or more.